

# ANNEXURE – I



## **GROUNDWATER – SANITATION (GW-SAN) NEXUS RESEARCH PROGRAMME**

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### **Programme Document**

August 2015

## I. Background

Arghyam, meaning 'Offering' in Sanskrit, is an Indian public charitable foundation set up with an endowment from Rohini Nilekani. The foundation is working in the water and sanitation sector since 2005 with the vision of 'Safe, Sustainable Water and Sanitation for All'.

Arghyam's mission is to improve access to clean water and sanitation by fostering partnership and networks of practice that include individuals, non-government organisations, governments, and research and academic organisations. This approach promotes and sustains Arghyam's vision of "Safe, sustainable, water and sanitation for all".

In putting into practice its vision, Arghyam emphasises on the principles of equity, sustainability, collaborations, capacity enhancement at various levels, community empowerment and innovation. Arghyam's work emphasizes on the inclusion of vulnerable and marginalised communities ensuring sustainability of water availability in terms of portability, adequacy, convenience, affordability. Hence, Arghyam designs its initiatives through the lenses of social, institutional, technical, environmental, and financial sustainability.

A decade of work has proven that safe and sustainable drinking water and sanitation cannot be achieved in isolation from each other, and hence an integrated and holistic approach is required. Given Arghyam's priority to sanitation and groundwater, a Groundwater-Sanitation (GW-SAN) Nexus Research Programme has been developed to deepen the understanding of the linkages between groundwater and sanitation in the Indian context, and move towards an integrated approach for their management in practice.

The conceptualization of the programme commenced in May 2014 with a Stakeholder workshop that brought together Arghyam's project partners, researchers, experts and practitioners from the sanitation and groundwater sectors. Another stakeholder workshop in January 2015, findings of a literature review commissioned, and further consultations with Arghyam advisors and experts from the sector, led to the finalization of the research framework.

The Indian Institute for Human Settlements (IIHS), Bangalore is engaged as the Programme Support Unit (PSU) and Knowledge Management Centre (KMC) for this research programme.

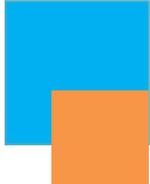


Table 1: Groundwater and Sanitation – Linkages and Challenges

<p>Horizontal distance between the pit and the hand-pump are not maintained</p>	<p>Deep pits (almost reaching the groundwater level) are constructed</p>
<p>Effluent from the pit latrines is let out into open drains</p>	<p>'Septic Tank', constructed like a pit latrine</p>

Source: IIHS Primary Studies, 2014-15.

## II. Research Programme: Thrust Areas, Projects and Results

As outlined above, the literature survey and consultations with stakeholders and experts have provided the key gaps in knowledge and practice regarding the linkages between groundwater and sanitation. The identified knowledge gaps are aimed to be addressed through research projects under the programme. The research projects are expected to be located in different hydro-geological settings across urban and rural India. The projects will also focus on impacts on the most vulnerable groups. While the primary objectives of the programme remains knowledge generation and dissemination to wider audience, the programme will also attempt to prioritise learning from existing knowledge within communities, para-professionals, and practitioners, and grass-root organisations; and in turn, feed back into the actual practice by these stakeholders.

Based on literature review findings and the deliberations during the workshops, seven (7) thrust areas for the GW-SAN research have been identified –

**a. Contamination Pathways**

Given the prevalence of on-site sanitation systems in India, it is important to understand various contamination pathways in saturated and unsaturated zones below ground level. While some literature exists globally, there are very few studies in the Indian context. Further, almost no work exists comparing the situation in different hydro-geological zones across the country. It is also not known very clearly how different densities of urban settlements impact groundwater differentially.

**b. Design, Construction and Management Practices (for on-site sanitation including monitoring)**

One of the key gaps in knowledge about the linkage between sanitation and groundwater is about design, construction and management of on-site sanitation systems as practised in different parts of India. While design standards exist for these systems (CPHEEO, Government of India, 2013), the reality of these design and construction practices is very different from these standards. This is further complicated by the fact that on-site installations are often below ground level and/or below building structures, and hence difficult to observe and maintain. Owners of properties often also do not recall specifications of the systems as-built, making an assessment of the efficiency of the systems difficult.

**c. High Risk Settlements and “Difficult” Geographies**

While gaps in knowledge exist across all of the above themes, some ‘difficult’ locations e.g. mountains, flood-prone areas, ecologically sensitive areas, deserve special attention since construction and management practices in these areas need adaptation of conventional approaches. Differences within the settlements, e.g. high-density areas, slums, low-lying areas, and their specific characteristics need to be examined as well.

**d. Socio- Economic Context**

It is important to understand the socio-economic context of the households because similar situations can lead to differential impacts on communities, especially the poor. Locational factors are known to restrict access to good quantity and quality of water, affordability and coping strategies across socio-economic groups. It also needs to be investigated how impacts differ for women and girl children. Finally, a greater understanding is needed about the condition of castes and communities involved in cleaning of pit latrines and septic tanks.

**e. Capacity Building of Stakeholders**

The majority of the latrines are constructed and hand pumps are installed by the masons or private contractors who are neither trained nor aware of these design standards. Preliminary evidence from some parts of the country shows that these practices often render the latrines to be unsafely discharging untreated excreta, also posing hazards for groundwater. Moreover, given that this sector is completely informal, there is wide variation in practices across cities, or even within one city. Hence, it is imperative to understand these practices, and also develop simple training modules and protocols for the households, contractors and masons, and other stakeholders.

Another gap that was consistently highlighted during workshops was the lack of capacity across the private and public sector. Capacity development needs to be addressed to achieve safe and sustainable practices, given the varied stakeholders involved, ranging from policy, planning, design and implementation.

#### **f. Integration with Policy and Programme**

One of the key priorities of this programme is to inform policy and influence practices on ground. This priority was decided upon because at present, knowledge being produced does not necessarily become available to stakeholders. The scaled-up implementation of programmes like Swachh Bharat and AMRUT provide an opportunity to demonstrate how improved designs and change in practices may be able to mitigate risks as also help in achieving goals of improved sanitation in a sustainable manner.

#### **g. Regional Resources**

Given the inter-connectedness of the hydro-logical cycle, it is important to be able to trace the cumulative impacts of particular forms of sanitation at the regional scale. This underlines the community character of sanitation with its attendant externality including community level public health outcomes beyond individuals and households. Further, the nature of aquifer makes it mandatory to address issues arising out of such inter-connectedness. This needs to address a combined consideration, therefore, of the groundwater-sanitation nexus at different scales that are appropriate in different parts of India.

Based on the above considerations, Table below summarises the key thrust areas and research themes/projects under each of them, and their associated outcomes and outputs.

S.No	THRUST AREAS <i>(Research proposals should be relevant to one or more of the below themes)</i>	SPECIFIC THEMES/ PROJECTS <i>(The following themes/projects have been identified as critical, however, ideas not listed here, but relevant to the theme are welcome)</i>	OUTCOMES	ASSOCIATED OUTPUTS
1.	Contamination Pathways	<ul style="list-style-type: none"> <li>• Pollutant transport and attenuation in the unsaturated and saturated zones beneath pit latrines and septic tanks.</li> <li>• The impact of monsoon rainfall intensities on pollutant transport through the unsaturated and saturated zones.</li> <li>• Comparative analysis across different hydro-geological areas</li> <li>• Impact of households densities on contamination (minimum distances between toilets)</li> <li>• Lateral spacing and suitable depth of subsoil for attenuation of different pollutants</li> <li>• Maximum loading of pollutants</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge gaps addressed through research projects</li> <li>• Findings from research incorporated in advisories and recommendations</li> <li>• Accumulated knowledge disseminated to inform policy and regulations</li> <li>• Governance mechanism and institutional framework recommended to influence practice</li> </ul>	<ul style="list-style-type: none"> <li>• Research Studies</li> <li>• Publications (peer-reviewed journals and other relevant formats)</li> <li>• Policy Briefs</li> <li>• Workshops and Conferences</li> </ul>

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2.	Design, Construction and Management Practices (for on-site sanitation including monitoring)	<ul style="list-style-type: none"> <li>• Practices followed by households and masons (including decision making practices for households, and existing on-the-job and other training for masons)</li> <li>• Development of simple protocols to document existing practices</li> <li>• Development of simple protocols for quality assurance</li> <li>• Design and construction practices across the whole water and wastewater cycle</li> <li>• Design of wells and other water supply sources</li> <li>• Design of pit latrines and septic tanks</li> <li>• Innovative use of treated waste water</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge gaps addressed through research projects</li> <li>• Findings from research incorporated in advisories and recommendations</li> <li>• Accumulated knowledge disseminated to inform policy and regulations</li> <li>• Governance mechanism and institutional framework recommended to influence practice</li> </ul>	<ul style="list-style-type: none"> <li>• Research Studies</li> <li>• Publications (peer-reviewed journals and other relevant formats)</li> <li>• Policy Briefs</li> <li>• Workshops and Conferences</li> </ul>

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3.	High Risk Settlements and “Difficult” Geographies	<ul style="list-style-type: none"> <li>• Disaster prone areas, particularly areas prone to flooding</li> <li>• Recharge zones in all Mountainous regions (Eastern, Western, Himalayan)</li> <li>• Water –scarce Regions</li> <li>• High Densities settlements like slums</li> <li>• Other High Risk Settlements</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge gaps addressed through research projects</li> <li>• Findings from research incorporated in advisories and recommendations</li> <li>• Accumulated knowledge disseminated to inform policy and regulations</li> <li>• Governance mechanism and institutional framework recommended to influence practice</li> </ul>	<ul style="list-style-type: none"> <li>• Research Studies</li> <li>• Publications (peer-reviewed journals and other relevant formats)</li> <li>• Policy Briefs</li> <li>• Workshops and Conferences</li> </ul>

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4.	Socio- Economic Context	<ul style="list-style-type: none"> <li>• Mapping risks and vulnerabilities of the users</li> <li>• Impact on health and livelihoods</li> <li>• Understanding demography vis-à-vis vulnerabilities; access &amp; equity (gender, caste, class)</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge gaps addressed through research projects</li> <li>• Findings from research incorporated in advisories and recommendations</li> <li>• Accumulated knowledge disseminated to inform policy and regulations</li> <li>• Governance mechanism and institutional framework recommended to influence practice</li> </ul>	<ul style="list-style-type: none"> <li>• Research Studies</li> <li>• Publications (peer-reviewed journals and other relevant formats)</li> <li>• Policy Briefs</li> <li>• Workshops and Conferences</li> </ul>

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5.	Capacity Building of Stakeholders	<ul style="list-style-type: none"> <li>• Focus on civil society, communities</li> <li>• Training for para –professionals</li> <li>• Needs assessment</li> <li>• Development of relevant curriculum for college graduates</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge gaps addressed through research projects</li> <li>• Findings from research incorporated in advisories and recommendations</li> <li>• Accumulated knowledge disseminated to inform policy and regulations</li> <li>• Governance mechanism and institutional framework recommended to influence practice</li> </ul>	<ul style="list-style-type: none"> <li>• Research Studies</li> <li>• Publications (peer-reviewed journals and other relevant formats)</li> <li>• Policy Briefs</li> <li>• Workshops and Conferences</li> </ul>

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6.	Integration with Policy and programmes	<ul style="list-style-type: none"> <li>• Projects on existing public programmes sites e.g. Swachh Bharat Mission related to any of the above thrust areas</li> <li>• Development of protocols for ULBs to ensure proper implementation and regulation of full-cycle of safe sanitation</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge gaps addressed through research projects</li> <li>• Findings from research incorporated in advisories and recommendations</li> <li>• Accumulated knowledge disseminated to inform policy and regulations</li> <li>• Governance mechanism and institutional framework recommended to influence practice</li> </ul>	<ul style="list-style-type: none"> <li>• Research Studies</li> <li>• Publications (peer-reviewed journals and other relevant formats)</li> <li>• Policy Briefs</li> <li>• Workshops and Conferences</li> </ul>

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7.	Regional Resources	<ul style="list-style-type: none"> <li>• Tracing Impacts at an appropriate Regional Scale</li> <li>• Consolidation of relevant data-sets e.g. overlaying existing data sets on sanitation information</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge gaps addressed through research projects</li> <li>• Findings from research incorporated in advisories and recommendations</li> <li>• Accumulated knowledge disseminated to inform policy and regulations</li> <li>• Governance mechanism and institutional framework recommended to influence practice</li> </ul>	<ul style="list-style-type: none"> <li>• Research Studies</li> <li>• Publications (peer-reviewed journals and other relevant formats)</li> <li>• Policy Briefs</li> <li>• Workshops and Conferences</li> </ul>